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FIRST RECORD OF THE ASIAN CLAM Corbicula largillierti (PHILIPPI, 1844) IN THE LOWER SÃO FRANCISCO RIVER, NORTHEASTERN BRAZIL

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Abstract

The Asian clam of the genus *Corbicula* is the most successful freshwater invader worldwide. In this research note, the presence of the *Corbicula largillierti* is recorded for the first time in the Lower São Francisco River. This record is based on the collection of living organisms from the Xingó Hydroelectric Power Plant reservoir. This is the second corbiculid species recorded in the region. Further investigation is required on characteristics such as its distribution, interactions with native and other invasive species, as well as its possible environmental impact.

Keywords: Non-indigenous species. Freshwater bivalve. Reservoir. Sergipe.

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1 Introduction

The introduction of non-indigenous species is thought to be the second major cause of biodiversity loss worldwide (BELLARD et al., 2016). Among freshwater invertebrates, the Asian clam of genus *Corbicula* Megerle von Mühlfeld, 1811 (Bivalvia, Cyrenidae) is the most successful freshwater invader worldwide, and it has major ecological and economic effects (SOUSA et al., 2008; CRESPO et al., 2015). Three species of corbiculid have been recorded in South America, with *Corbicula fluminea* (Müller, 1774) having a wider distribution than either *Corbicula largillierti* (Philippi, 1844) and *Corbicula fluminalis* (Müller, 1774) (REYNA et al., 2018; DARRIGRAN et al., 2020).

In South America, *C. largillierti* was recorded for the first time in the La Plata River, in Argentina, in the 1960s (ITUARTE, 1981). In Brazil, this species was initially recorded in the Mato Grosso Pantanal (CALLIL; MANSUR, 2002) and in the Sinos River basin in Rio Grande do Sul (MANSUR; PEREIRA, 2006). This was followed by reports for the Middle São Francisco River and the hydrographic basin of the Paraíba do Sul, Doce, and Tocantins rivers (MANSUR et al., 2004; SANTOS et al., 2012). More recently, this species has been recorded as being present in the water-transposition channels and reservoirs near cities of the semi-arid region supplied with water from the São Francisco River (AZEVÊDO et al., 2014, 2016; ALMEIDA et al., 2015; THIENGO et al. 2017).

In this research note, the presence of *C. largillierti* is recorded for the first time from Xingó reservoir, Lower São Francisco River, northeastern Brazil. This is also the first recorded sighting of this clam in the state of Sergipe and has improved our knowledge of the distribution of the species as well as the number of invasive species in the region.

2 Material and Methods

The Xingó is the last in a series of six hydroelectric power plants built along the São Francisco River and is located in the lower third of the river basin between the states of Sergipe and Alagoas (Figure 1). It was inaugurated in 1994, and its reservoir has an area of 60km^2 and a volume of 3,300 x 10^6 m^3 (SANTOS et al., 2016).

During a field trip carried out on November 3, 2019, a number of freshwater bivalve individuals were caught by hand at the Sergipe margin (0 to 0.5m of depth) of the Xingó reservoir, at the Lower São Francisco River (9°32'15" S, 37°58'28" W: Figure 1). They were sent to the laboratory for further analysis, where each individual was identified according to Pereira et al. (2012), and their shell length was measured with a digital pachymeter (precision of 0.01 mm).

3 Results and Discussion

The specimens collected in the Xingó reservoir margin had the following characteristics: shells with olive green-brownish outer and purple or violet inner surfaces, the presence of concentric and low ribs, flat umbo, posterior region without rostrum and absence of sinus on pallial line (Figure 2). All these shell characteristics corroborate the diagnostic characters of *C. largillierti*. At the sampling site, 32 individuals with shell lengths ranging from 12.21 to 17.68 mm (mean: 15.22±1.51 mm) were collected in a fine sandy bottom (Figure 3). According to McMahon (1983), individuals of this size class correspond to young adults (one year), suggesting a recent invasion. Similar size classes range with a dominance of young adults were also recorded in central (REYNA et al., 2013) and northwestern Argentina (TORRE; REYNA, 2013).

Corbicula largillierti arrived in South America via ballast water (ITUARTE, 1981) and then spread northward as a consequence of human activities, such as the transport of both water and materials for the building of dams and water transposition channels as well as due to expanding aquaculture activities (MANSUR et al., 2016). Since *C. largillierti* had previously been recorded in the Middle São Francisco River, its downstream distributional expansion was expected. This finding confirms its presence in the lower river sector and corresponds to the first record of this invasive species in Sergipe. In this area, another invasive corbiculid species, *C. fluminea*, had been reported ten years ago (SANTANA et al., 2013). Currently, this species is distributed along the entire lower river sector (pers. obs.), and it has also been recorded in other local river basins (ROSA; DANTAS, 2020). Moreover, *C. fluminea* was the only corbiculid species recorded in the Xingó reservoir (MIYAHIRA et al., 2020).

Although both species may be sympatric, *C. largillierti* appears to be a less effective competitor than *C. fluminea*, and this interspecific competition for space and food has resulted in a decrease in population size and even displacement of the *C. largillierti* (DARRIGRAN, 1992; RESHAID et al., 2017; REYNA et al., 2018).

Furthermore, *C. largillierti* is more sensitive to lower oxygen levels, limiting the species' ability to colonize and survive at the bottom of the reservoir (RODRIGUEZ et al., 2020). Indeed, *C. largillierti* seems to be better adapted to streams and brook environments (REYNA et al., 2013; RESHAID et al., 2017).

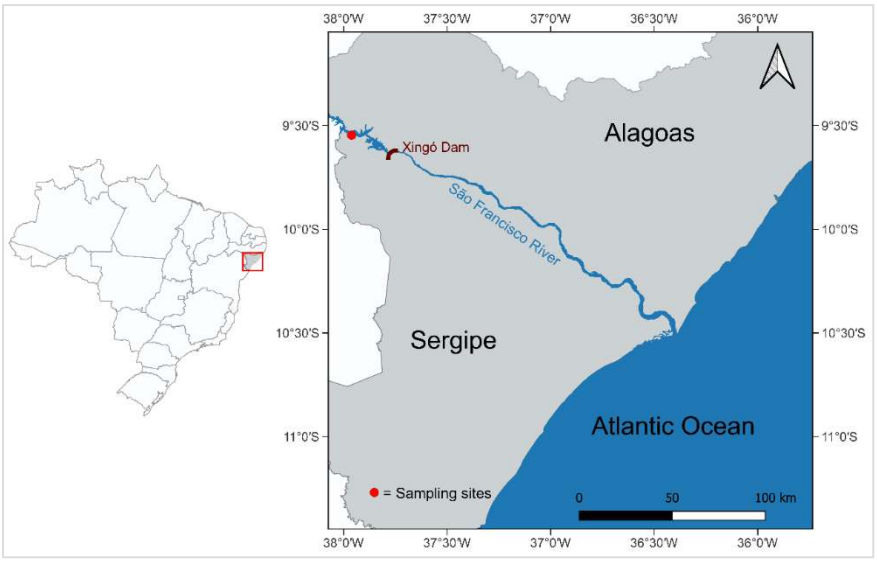

Figure 1. Map of the Low São Francisco River indicating the sampling site where the individuals of the *Corbicula largillierti* (Philippi, 1844) were collected.



Figure 2. Picture of some individuals of the *Corbicula largillierti* (Philippi, 1844) collected in the Xingó reservoir margin, Lower São Francisco River.



Figure 3. Xingó reservoir margin where the individuals of the *Corbicula largillierti* (Philippi, 1844) were collected.

In the sampled area of the Xingó reservoir, only *C. largillierti* individuals were recorded. However, due to limitations imposed by low spatial replication (i.e., a single sampling site), it is impossible to state that this pattern reflects either the habitat preferences of this species or that it is due to competition with other species (*C. fluminea* or any other native species).

Therefore, further sampling is required to determine the distribution pattern of *C. largillierti* along the Lower São Francisco River, to evaluate its interactions with either native or invasive species, and to determine its impacts on the local environment.

4 Conclusions

Increasing levels of scientific research in the region have led to the recording of the invasive Asian clam *C. largillierti* for the first time in the Lower São Francisco River. This finding increases our understanding of species distribution, especially in northeastern Brazil.

Furthermore, it reinforces the requirement for continuous monitoring programs to detect non-indigenous species as early as possible and thus supports management measures.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

The author was solely responsible for all stages of this study.

DECLARATION OF INTEREST

The author disclosed that they have no known competing financial interests or personal relationships that could have appeared to influence the study reported in this manuscript.

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